AMENDMENTS TO THE SPECIFICATION

Page 2

Please **amend** paragraph **[0006]** to read as follows:

[0006] Further, with the recent discovery that the electronic state of a material brought about when it is irradiated with femtosecond light pulses is varied according to the direction of a chirp, it has become necessary to precisely control the direction and amount of a chirp in order to synthesize a new material on the basis of such a new principle. Also, in the field of optical communication, in order to remove or reduce the time spread of a light pulse signal, or the time delay between successive wavelength signals in WDM (wavelength Division Multiplexing), there has become necessary a chirp control apparatus which can control or change the direction of a chirp and the magnitude of its amount as desired and which ~~excess~~excels in cost reduction and easiness for using. While demands for the linear chirp technique have thus been growing considerably, they can hardly be met by conventional linear chip techniques as described below.

Pages 3/4

Please **amend** paragraph **[0010]**, which bridges page 4, to read as follows:

[0010] References cited:

Reference 1: Kazuhiko Misawa and Takayoshi Kobayashi, J. Chem. Phys. 113 (2000):

Reference 2: G. Cerullo, C. J. Bardeen, Q. Wang, and C. V. Shank, Chem. Phys. Lett. 262, 362 (1996);

Reference 3: C. J. Bardeen, Q. Wang, and C. V. Shank, Phys. Rev. Lett. 75, 3410

Reference 4: J. Cao, C. J. Bardeen, and K. R. Wilson, Phys. Rev. Lett. 80, 1406 (1998);

Reference 5: Jennifer L. Herek, Wendel Wohlleben, Richard J. Cogdell, Dirk Zeidler & Marcus Motzkus, "Quantum control of energy flow in light Harvesting", Nature 417, 533 (2002);

Reference 6: Maruzen Advanced Technology, Edition for Electronics, Information and Communication, edited by Tatsuo Yajima, Maruzen K. K., issued March 15, ~~2000~~1990, pages 18–19;

Reference 7: Maruzen Advanced Technology, Edition for Electronics, Information and Communication, edited by Tatsuo Yajima, Maruzen K. K., issued March 15, ~~2000~~1990, pages 96–97;

Reference 8: Robert Szipocs and Karpat Ferencz, Christian Spielmann and Ferenc Krausz "Chirped multilayer coatings for broadband dispersion control in femtosecond lasers", Optics Letters Vol. 19, No. 3, 1994. 2. 1, 201; and

Reference 9: Rick Trebino, Kenneth W. DeLong, David N. Fittinghoff, John N. Sweetser, Marco A. Krumbugel, and Bruce A. Richman, and Daniel J. Kane "Measuring ultrashort laser pulses in the time-frequency domain using frequency-resolved optical gating", Rev. Sci. Instrum. 68(9), 3277 (1997).

Page 4

Please **amend** paragraph **[0012]** to read as follows:

[0012] Fig. 5 diagrammatically illustrates a conventional linear chirp apparatus using dielectric multilayer film mirrors. The apparatus illustrated comprises two dielectric multilayer

film mirrors 51 and 51 whose relative positions can be adjusted to change the number of reflections of a light pulse 52 by them, thereby controlling the amount of a chirp applied to the light pulse 52. Fig. 5(a) shows the case that the number of reflections is two (2) whereas Fig. 5(b) shows the case that the number of reflections is four (4). The broken line shown in Fig. 5(b) indicates the optical axis in the case of the number of reflections being two as shown in Fig. 5(a). It is thus required that the dielectric multilayer film mirrors 51 and 51 be moved relatively away from each other to decrease the number of reflections if the negative chirp amount should be reduced and that they be moved relatively towards each other to increase the number of reflections if the negative chirp amount should be augmented.

Page 11

Please **amend** paragraph **[0026]** to read as follows:

[0026] The inclination at which the movable mirror 4 is inclined is an inclination such that an input or incoming light ray 5 that is incident obliquely from one end 3a of the space 3 and is then allowed to reflect on and between the dielectric multilayer film ~~mirrors 2 and 2~~mirror surfaces 2a and 2a a plurality of times is reflected into a direction parallel to the dielectric multilayer film ~~mirrors 2 and 2~~mirror surfaces 2a and 2a in an incidence plane 7 and towards the one end 3a of the space 3. Here, the incidence plane as is apparent from Fig. 1(b) is a plane 7 defined by a ray vector of the incident light ray 5 and a plane-normal 6 vector of the mirror surface 2a of each dielectric multilayer film mirror 2. This term and also the term "angle of

incidence" which is used to mean an angle that the ray vector of the incident beam 5 makes with the plane-normal vector 6 will be used hereafter to mean as defined here.

Pages 11/12

Please **amend** paragraph **[0028]**, which bridges page 12, to read as follows:

[0028] According to the makeup mentioned above, an input light ray 5 incident from the one end 3a of the two dielectric multilayer film mirrors 2 and 2 arranged parallel to each other is reflected by and between the dielectric multilayer film mirror surfaces 2a and 2a a ~~number~~plurality of times, reaching the movable mirror 4 where it is further reflected by the movable mirror 4 to become a light ray that is parallel to the dielectric multilayer film mirror surfaces 2a and 2a, resulting in an output or outgoing light 8. Thus, moving the movable mirror 4 forwards or backwards to change the number of reflections of the input light allows a chirp with an amount proportional ~~to a~~to the number of such reflections to be imparted thereto while maintaining the direction in which an output light 8 issues constant regardless of a position which the movable mirror 4 takes. As a result, there is here provided a linear opto-frequency chirp amount variable apparatus which has no need to realign the optical axis each time the amount of a chirp is to be altered or to additionally include any optical system for alignment of the optical axis and which thus excels in cost reduction and easiness for using.

Page 13

Please **amend** paragraph **[0033]** to read as follows:

[0033] The direction in which the movable mirrors 4a and 4b can be moved is a direction that is parallel to the dielectric multilayer film mirror surfaces2a and 2a and extends in the incidence plane 7, so that moving the first or second movable ~~mirror 4a~~<u>mirrors 4a and 4b</u> forwards or backwards in this direction changes the distance between them, thereby changing the amount of a chirp to be imparted to the incident light as an input light.

Please **amend** paragraph **[0034]** to read as follows:

[0034] According to the makeup mentioned above, an incoming light 5 incident parallel to the dielectric multilayer film mirror surfaces 2a and 2a from one end of the two dielectric multilayer film mirrors 2 and 2 arranged parallel to each other is allowed to be reflected by the first movable mirror 4a so as to reach the second movable mirror 4b upon reflecting on and between the two dielectric multilayer film ~~mirrors 2 and 2~~<u>mirror surfaces 2a and 2a</u> a plurality of times and then to be reflected by the second movable mirror 4b and to outgo from the other end 3b of the space 3 defined between the two dielectric multilayer mirrors 2 and 2 and in the same direction in which it is incident. Thus, moving the first or second movable mirror 4a, 4b forwards or backwards allows changing the amount of a chirp to be imparted to the incident light as an incoming light while permitting an outgoing light to propagate in the same direction as the incoming light.

<u>**Pages 13/14**</u>

Please **amend** paragraph **[0036]**, which bridges page 14, to read as follows:

[0036] Fig. 3 diagrammatically illustrates the makeup of a linear opto-frequency chirp amount variable apparatus that constitutes a third form of implementation of the present invention. The apparatus shown in Fig. 2 has a limitation in the angle of incidence in that if the light is incident at a small angle of incidence, upon reflection it will be obstructed by the thickness of the movable mirror as is apparent from the Figure. The apparatus of the third form of implementation has the feature that it allows reducing the angle of incidence and thus increasing the amount of a chirp to be imparted. In accordance with the third form of implementation, the linear opto-frequency chirp amount variable apparatus 30 comprises a pair of dielectric multilayer film mirrors 2 and 2 arranged so that their mirror surfaces ~~2a and 2b~~<u>2a and 2a</u> extend parallel, and are opposed, to each other, a fixed mirror 9 disposed in a space 3 defined between the two dielectric multilayer film mirrors 2 and 2 at a center of the space, and a first and a second movable mirror 4a and 4b which are disposed at opposite sides of the fixed mirror 9, respectively.

<u>Pages 14/15</u>

Please **amend** paragraph **[0037]**, which bridges page 15, to read as follows:

[0037] The fixed mirror 9 has a first and a second reflecting surface 9a and 9b each of which is inclined at a given inclination, and the first and second movable mirrors 4a and 4b have their respective angles of inclination and are movable in a given direction. The inclination of the first reflecting surface 9a of the fixed mirror 9 is an inclination such that an incident light 5 that is incident parallel to the dielectric multilayer film mirror surfaces 2a and 2a from one end 3a of

the space 3 is reflected by the first reflecting surface 9a so as to reflect on and between the dielectric multilayer film mirrors 2a and 2a a plurality of times in an incidence plane 7 and then to return to the first movable mirror 4a. And, the inclination of the first movable mirror 4a is an inclination such that the incident light 5 having so reflected a plurality of times is reflected by the first movable mirror 4a into a direction that is parallel to the dielectric multilayer film mirror surfaces 2a and 2a and extends in the incidence plane 7, a plurality of times towards the second movable mirror 4b. And, the inclination of the second movable mirror 4b is an inclination such that the light having reflected from the first movable mirror 4a is reflected by the second movable mirror 4b so as to reflect on and between the dielectric multilayer film ~~mirrors 2 and 2~~<u>mirror surfaces 2a and 2a</u> a plurality of times in the incidence plane 7 and then to ~~return~~<u>return to</u> the second reflecting surface 9b of the fixed mirror 9. And, the inclination of the second reflecting plane 9b of the fixed mirror 9 is an inclination such that the light from the second movable mirror 4b, upon having so reflected a plurality of times, is reflected by the second reflecting surface 9b into a direction that is parallel to the dielectric multilayer film mirror surfaces 2a and 2a in the incidence plane 7 and towards the other end 3b of the space 3.

<u>Page 15</u>

Please **amend** paragraph **[0039]** to read as follows

[0039] According to the makeup mentioned above, an incoming light 5 incident parallel to the dielectric multilayer film mirror surfaces 2a and 2a from one end 3a of the two dielectric multilayer film mirrors 2 and 2 arranged parallel to each other is allowed to be reflected by the

first reflecting surface 9a of the fixed mirror 9 so as to reach the first movable mirror 4a upon reflecting on and between the two dielectric multilayer film ~~mirrors surface~~mirror surfaces 2a and 2a a plurality of times, then to be reflected by the first movable mirror 4a into a direction same as that in which it is incident to reach the second movable mirror 4b, then to be reflected by the second movable mirror 4b so as to reflect on and between the two dielectric multilayer film ~~mirrors 2 and 2~~mirror surfaces 2a and 2a a plurality of times to reach the second reflecting surface 9b of the fixed mirror 9, and finally to be reflected by the second reflecting surface 9b of the fixed mirror 9 so as to outgo from the other end 3b of the space 3 in a direction same as that in which it is incident. Thus, moving the first or second movable mirrors 4a, 4b forwards or backwards to change the distance between them changes the amount of a chirp to be imparted to the incident light as an input light.

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Please **amend** paragraph **[0040]**, which bridges page 26, to read as follows:

[0040] In the apparatus according to the third form of implementation in which a plurality of light reflections occur always in front of the reflecting surface of a movable mirror, the angle of incidence for a light ray incident on the movable mirror can be made smaller than those in the arrangements of Figs. 1 and 2. Accordingly, an apparatus is provided that can control the number of reflections for an input light by controlling the distance between the first and second movable mirrors 4a and 4b and can thus impart to the input light an amount of chirp proportional to ~~a~~ ~~number~~the number of reflections thereof and that can issue an output light in a direction same as

the input light is incident while permitting its angle of incidence to be reduced. As a result, it becomes possible to increase the number of reflections per unit length, which makes a chirp greater in amount well controllable.

Page 16/17

Please amend paragraph [0044], which bridges page 17, to read as follows:

[0044] Results of the measurement are shown in graphs of Fig. 4 in which in each graph the abscissa axis represents time, and the right-hand side and left-hand side ordinate axes represent the electric field strength of the femtosecond light pulse (arbitrary memory) and its instantaneous frequency, respectively. These graphs shown in Figs. 4(a), 4(b) and 4(c), respectively, indicate the measurements taken when the number of reflections was increased in this order. In each of the graphs, the curve A represents a distribution of electric field strength of the femtosecond light pulse on the time axis, the curve B represents the output of the FROG measuring device, and the line C represents the instantaneous frequency derived from the curve B. By the way, the numeral in each graph indicates a change in frequency per unit time, called chirp rate, representing a gradient of the line C.